Properties of Silliciclastic Sedimentary Rock

Lecture 10#

Sedimentary rock: Rock, which is form by sedimentation, cycles (weathering-transportation-sedimentation-digenesis). The media of transportation L water, wind, glaciers, etc. form on the surface of the earth, under particular pressure and lower temperature.

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Sediment composition:

- Mineral fragment or terrigenous (detrital or clastic)
- Material from chemistry process (authigenic material): carbonate, phosphate, etc.
- Allochem material (result from the previous precipitation) :fossil, organic material.

Minerals in sedimentary rock:

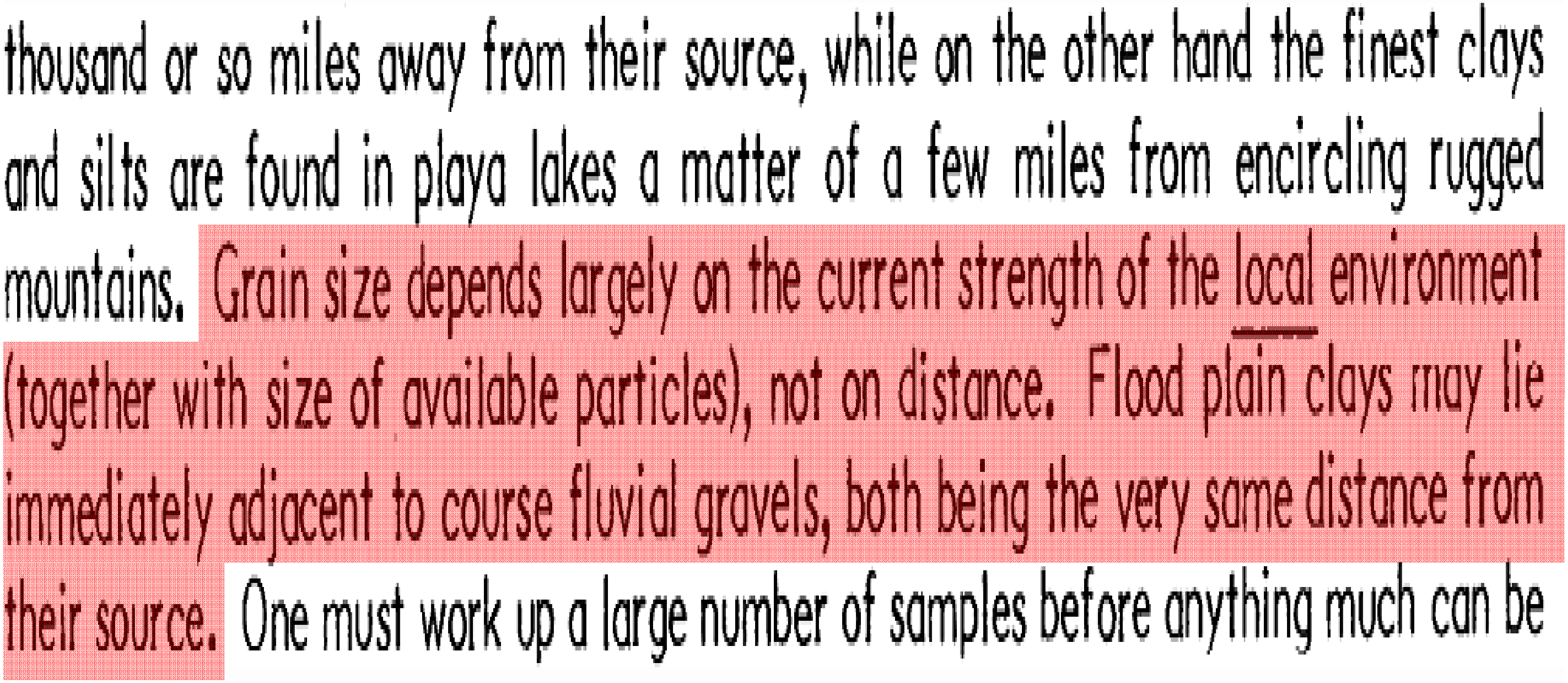
- Authigenic mineral:
    - Forming on sedimentation area and directly being deposit
    - Example: gypsum, calcite, anhydrite, iron oxide, halite, glaukonit
- Allogenic mineral:
    - Forming outside the sedimentation area
    - Being transport and the deposit on the sedimentation area.
    - Have to resistance from weathering and erosion during the transportation until deposition.

Properties of Sedimentary Rock

- Grain Size
- Sorting
- Roundness
- Fabric

The grain size depends on:

1. Type of weathering : chemistry ➔ fine grain
   Mechanics ➔ coarse grain
2. Type of transportation.
3. Transportation time and distance.



thousand or so miles away from their source, while on the other hand the finest clays and silts are found in playa lakes a matter of a few miles from encircling rugged mountains. Grain size depends largely on the current strength of the local environment (together with size of available particles), not on distance. Flood plain clays may lie immediately adjacent to course fluvial gravels, both being the very same distance from their source. One must work up a large number of samples before anything much can be

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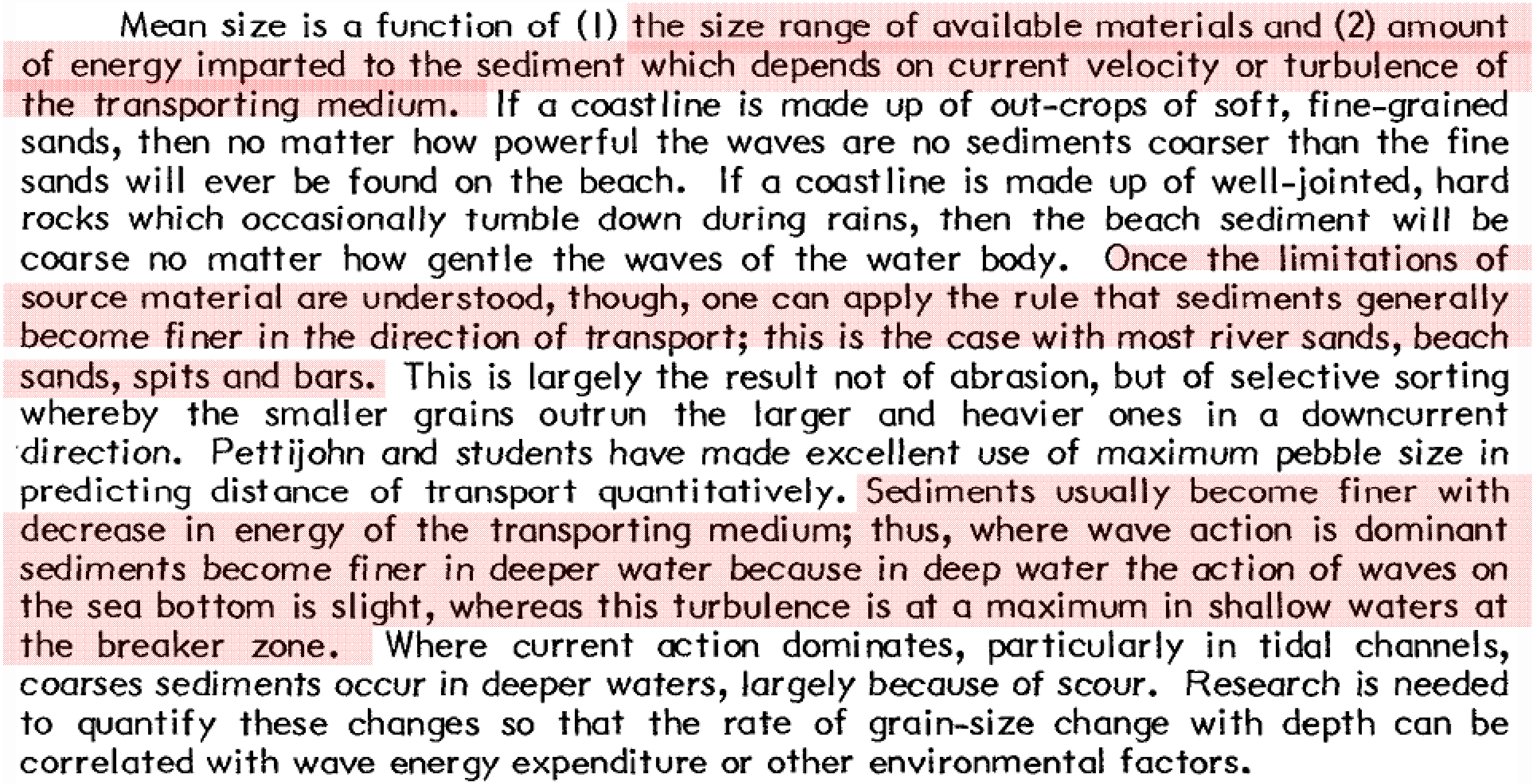

Mean size is a function of (1) the size range of available materials and (2) amount of energy imparted to the sediment which depends on current velocity or turbulence of the transporting medium. If a coastline is made up of out-crops of soft, fine-grained sands, then no matter how powerful the waves are no sediments coarser than the fine sands will ever be found on the beach. If a coastline is made up of well-jointed, hard rocks which occasionally tumble down during rains, then the beach sediment will be coarse no matter how gentle the waves of the water body. Once the limitations of source material are understood, though, one can apply the rule that sediments generally become finer in the direction of transport; this is the case with most river sands, beach sands, spits and bars. This is largely the result not of abrasion, but of selective sorting whereby the smaller grains outrun the larger and heavier ones in a downcurrent direction. Pettijohn and students have made excellent use of maximum pebble size in predicting distance of transport quantitatively. Sediments usually become finer with decrease in energy of the transporting medium; thus, where wave action is dominant sediments become finer in deeper water because in deep water the action of waves on the sea bottom is slight, whereas this turbulence is at a maximum in shallow waters at the breaker zone. Where current action dominates, particularly in tidal channels, coarses sediments occur in deeper waters, largely because of scour. Research is needed to quantify these changes so that the rate of grain-size change with depth can be correlated with wave energy expenditure or other environmental factors.

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Table 54: Grain-Size Scale for Sediments

		U.S. standard sieve mesh	millimetres		phi (φ) units	Wentworth size class
Gravel			4,096		−12	
			1,024		−10	boulder
			256	256	−8	
			64	64	−6	cobble
		5	4	4	−2	pebble
		6	3.36		−1.75	
		7	2.83		−1.5	granule
		8	2.38		−1.25	
		10	2.00	2	−1.0	
Sand		12	1.68		−0.75	
		14	1.41		−0.5	very coarse sand
		16	1.19		−0.25	
		18	1.00	1	0	
		20	0.84		0.25	
		25	0.71		0.5	coarse sand
		30	0.59		0.75	
		35	0.50	1/2	1.0	
		40	0.42		1.25	
		45	0.35		1.5	medium sand
		50	0.30		1.75	
		60	0.25	1/4	2.0	
		70	0.210		2.25	
		80	0.177		2.5	fine sand
		100	0.149		2.75	
		120	0.125	1/8	3.0	
		140	0.105		3.25	
		170	0.088		3.5	very fine sand
		200	0.074		3.75	
		230	0.0625	1/16	4.0	
Mud	Silt	270	0.053		4.25	
		325	0.044		4.5	coarse silt
			0.037		4.75	
			0.031	1/32	5.0	
			0.0156	1/64	6.0	medium silt
			0.0078	1/128	7.0	fine silt
			0.0039	1/256	8.0	very fine silt
	Clay		0.0020		9.0	
			0.00098		10.0	
			0.00049		11.0	clay
			0.00024		12.0	
			0.00012		13.0	
			0.00006		14.0	

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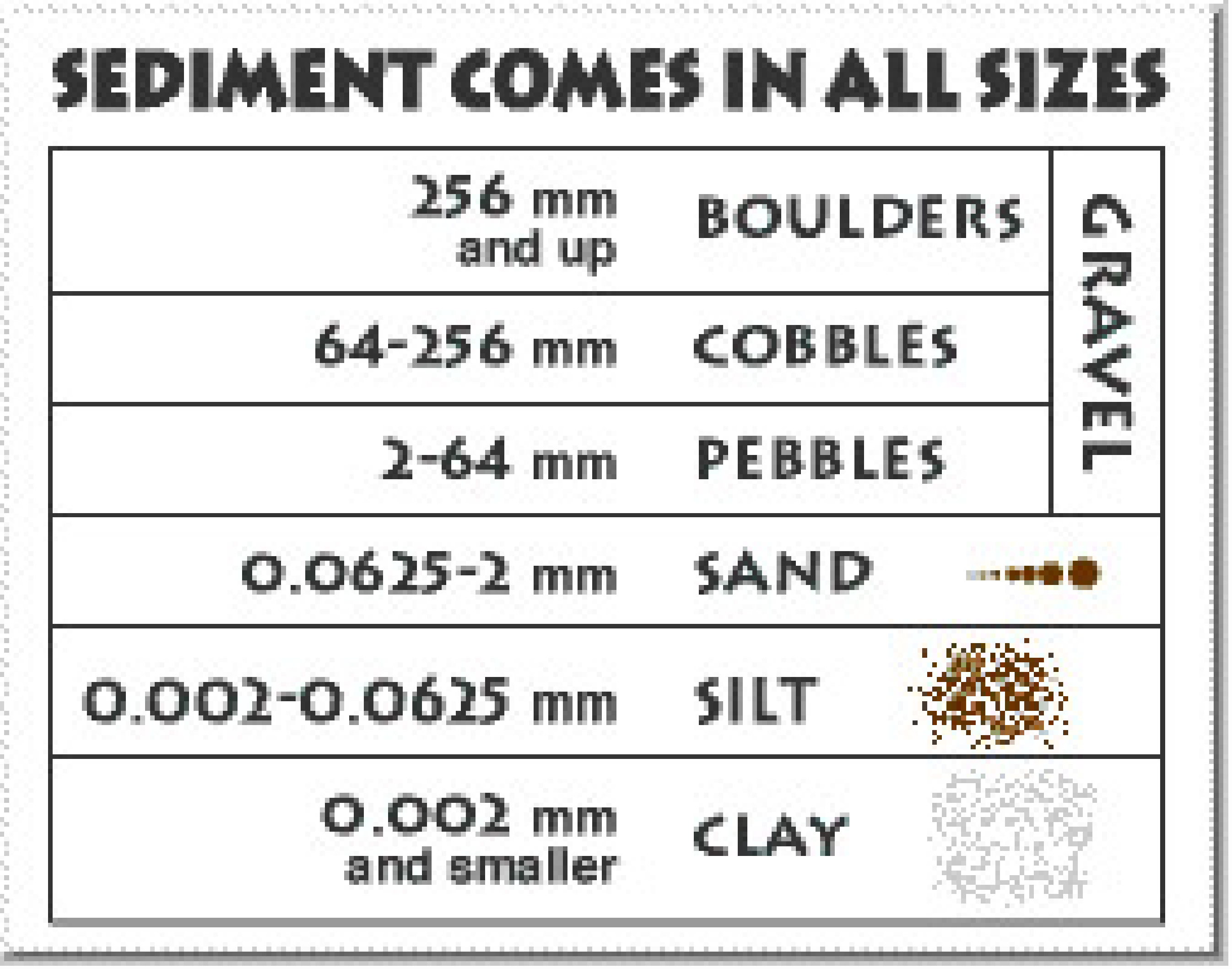

SEDIMENT COMES IN ALL SIZES

256 mm and up	BOULDERS	GRAVEL
64-256 mm	COBBLES	
2-64 mm	PEBBLES	
0.0625-2 mm	SAND	
0.002-0.0625 mm	SILT	
0.002 mm and smaller	CLAY	

Sorting: degree of uniformity or similarity of grain size.